

ABSTRACT

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1. *Chlorophyll a* (Chl a) is the primary photosynthetic pigment in most plants and algae. It is a green pigment that absorbs light energy in the blue and red regions of the visible spectrum. Chl a is essential for the light-dependent reactions of photosynthesis, where it converts light energy into chemical energy.

2. *Chlorophyll b* (Chl b) is an accessory pigment found in green plants and algae. It is a yellow-green pigment that absorbs light energy in the blue and orange regions of the visible spectrum. Chl b transfers the absorbed energy to Chl a for use in photosynthesis.

3. *Carotenoids* are a group of pigments that include carotenes and xanthophylls. They are responsible for the yellow, orange, and red colors seen in autumn foliage. Carotenoids absorb light energy in the blue and green regions of the visible spectrum and transfer the energy to Chl a. They also play a role in protecting the photosynthetic apparatus from damage by reactive oxygen species.

4. *Xanthophylls* are a subset of carotenoids that are primarily responsible for the yellow color of autumn leaves. They absorb light energy in the blue and green regions of the visible spectrum and transfer the energy to Chl a. Xanthophylls also play a role in photoprotection, helping to dissipate excess light energy as heat to prevent damage to the photosynthetic system.

5. *Anthocyanins* are water-soluble pigments that give autumn leaves their red and purple colors. They are not directly involved in photosynthesis but are produced in response to environmental factors such as low temperatures and high light intensity. Anthocyanins can act as antioxidants, protecting the leaf cells from oxidative damage.